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ON THE AURORA BOREALIS.

The *aurora borealis, northern lights*, or *streamers*—a kind of meteor appearing in the northern part of the heavens, mostly in the winter season and in frosty weather. It is not known at what time this meteor was first observed. The first recorded in Britain was the remarkable one, on the 30th January, 1560. From that period till about thirty or forty years ago, they were generally seen in Ireland almost every winter season; and sometimes every night during certain periods of the year. It is remarkable, however, that of late years, they have scarcely been seen in this country; but I understand a very brilliant aurora borealis was observed this winter, in Scotland. This phenomenon was certainly known to the ancients; and is described by Aristotle in his Meteorology, lib. 1, c. 4—5, as well as by many others of the ancient philosophers. They generally begin in the north, extending towards the west, but sometimes inclining to the east, a few hours after sunset, or between that and midnight, by a cloud appearing in the horizon, sometimes a few degrees above it, seldom so high as 40°, and scarcely above 50°; or the cloud is separated from the horizon, so that the blue sky may be seen between them. When the phenomenon increases so as to spread to a considerable extent, its progress shows itself by a general movement of the whole mass; numerous breaches are formed in the arch, and instantly disappear, while vibratory corruscations of light strike as by shocks every portion of the matter constituting the phenomenon. It is in the northern latitudes of Sweden and Lapland, that the aurora boreales are so singularly beautiful, and afford travellers, by their almost constant effulgence, a very beautiful light during the long winter nights. A more interesting spectacle can scarcely be conceived—but whoever sees it for the first time, cannot behold it without terror. For fine as the illumination is, it is attended with a hissing noise through the air, terrific in the extreme. The natives describe what they then hear by the expression, *Spolachi codjat*, that is, *the raging heat is passing;* and in some parts of Lapland, the inhabitants believe, that it is the spirits of the dead engaged in battle. And so fearful is the sound, that the dogs of the hunters on the borders of the icy sea, are so frightened, that they lie down, and will not move till the noise is passed. Various theories have been formed by philosophers in order to account for the streamers; but their origin, with their appearing and non appearing, is even at this day a matter of doubt. They were by the ancients considered to arise from vapours and exhalations, which, rising from the earth, mix together, and at length take fire; others again imagine, that the ice and snow of the polar circle reflect the solar rays towards the concave surface of the upper regions of the atmosphere, whence they were sent back to us, and produced all the appearances that accompany the aurora borealis. Among the moderns, Mairan supposes that the phenomenon takes place when the solar atmosphere approaches so near the earth as to be more exposed to the attraction of our planet than to the sun's attraction, and must therefore fall into our atmosphere, and by the more rapid circulation of the particles of air in the equatorial regions, it is soon repelled towards the poles; and this he states as the reason why the aurora borealis appears oftenest in the north; and then proceeds to explain the other circumstances of the phenomenon, and also the zodiacal light. But it has been calculated, that the streamers are sometimes elevated more than 780 miles above the surface of the earth, so in order to maintain his theory, he was obliged to give the atmosphere a height incomparably greater than is generally ascribed to it, or, than it really has; besides it is plain, according to this hypothesis, that the streamers should proceed from the equator to the poles, instead of proceeding from the poles to the equator, as they invariably do.

Euler next proposed a theory which supposes the particles of our atmosphere to be driven by the impulse of the solar rays to a great distance, and to become luminous by these rays being reflected on their surface. He extends this explanation to the appearance of the tails of comets, and the zodiacal light; but it is needless to follow him, as his whole theory is founded on gratuitous assumptions.

The next, and probably the *true* theory, is that of the celebrated Dr. Franklin: according to him, the electric fluid conveyed from the equator to the polar regions, by clouds that are charged with it, falls with the snow on the ice that covers those regions; and being accumulated there, breaks through the low atmosphere at the pole, and runs along the vacuum over the air towards the equator, diverging as the degrees of longitude enlarge, till it finds a passage to the earth in more temperate climates, or is mingled with the upper air, and gives all the appearance which the northern lights assume.

Now, it can be shown experimentally, that in exceedingly rarified air, the colour of the electric spark passing in through it is green; in denser air, it has a blue tint; and passes to a violet and purple as the condensation of the air is increased. In making experiments it is found, that in proportion as the medium is more rare, its conducting power increases, and a smaller intensity of electricity is required for the production of light. In the ordinary vacuum of the air-pump, the passage of electricity is rendered sensible by streams or columns of different light, occasionally varying in their breadth and intensity, and exhibiting movements which give them a marked resemblance to the corruscations of the aurora borealis, and almost confirming the theory of Franklin. The ingenious Mr. Dalton, in his Meteorological Observations and Essays, supposes the aurora borealis to be a *magnetic* phenomenon, whose beams are governed by the earth's magnetism; as it is highly probable that magnetism is nothing but a kind of electricity, they of course are the same, or the one only a modification of the other, similar to electricity and galvanism; Mr. Dalton's theory differs in that case but little from that of Dr. Franklin.

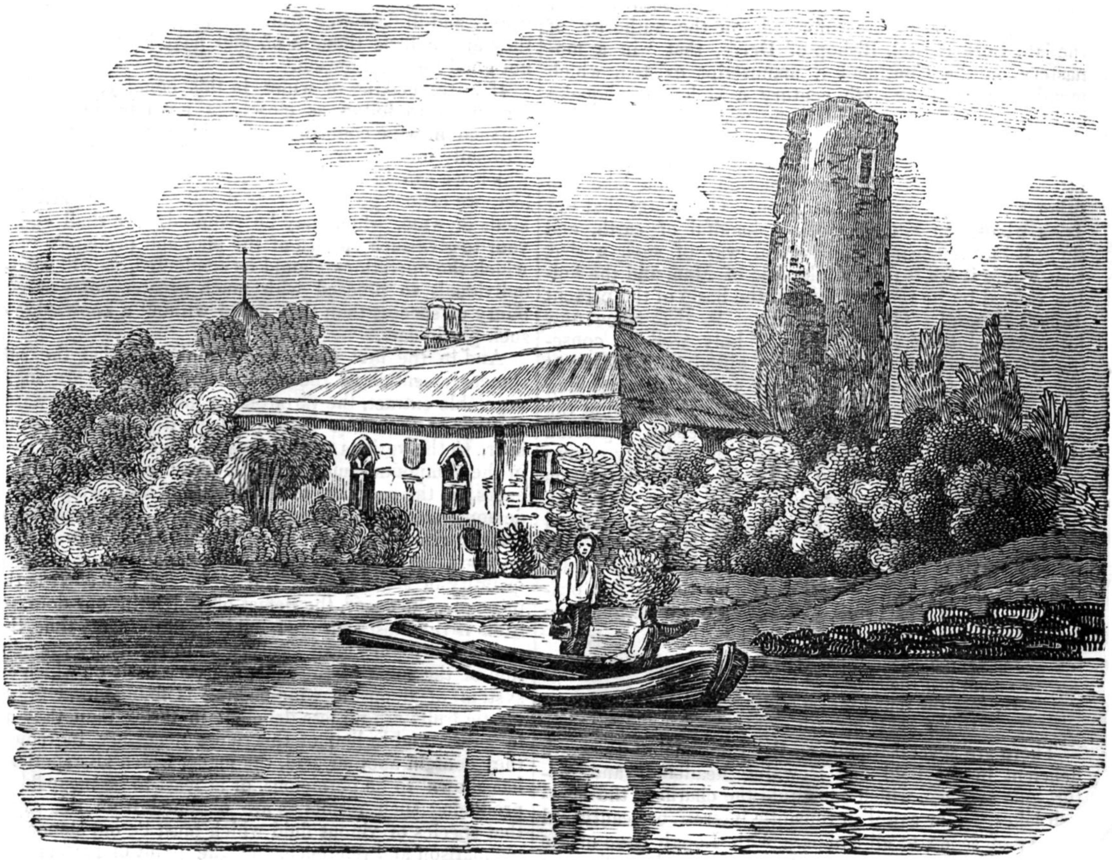
The latest theory of the aurora borealis is that of the ingenious Swedish philosopher, M. Libos, or as Dr. Gregory spells it, Libes. (See Haüg's Nat. Phil. Trans. by Gregory.) He proceeds by stating that the production of hydrogen gas is next to nothing at the poles, therefore as often as the electricity is put into an equilibrated state in the atmosphere, the spark, instead of passing through a mixture of hydrogenous and oxygenous gas, at the poles, as it does in our climates, must pass through a mixture of oxygenous and azotic (or nitrogenous) gas, and therefore cause a production of *nitrous gas, nitrous acid* and *nitric acid*, all which give birth to ruddy vapours, whose red colour will vary according to the quantity and proportion of those different substances which are generated; these vapours are carried towards the meridian, where the air is most dilated, so that they approach more and more towards the spectator, and it is probable that their motion may be assisted by a north wind. Lastly, the slight detonations which are sometimes heard, depend upon the small quantity of hydrogenous gas, which is found in the upper regions of the atmosphere, and which combines with the oxygen to form water. These principles, at the same time that they account, in M. Libes's estimation, for all the phenomena accompanying the aurora borealis, explain also why it is so common towards the poles, and so rare in temperate regions; while thunder, which is frequent in the torrid zone, is scarcely ever heard in the polar regions. The disengagement of hydrogen gas is very considerable at the equator, and in all the torrid zone; but very little towards the poles; and when we excite the electric spark in a mixture of hydrogen, oxygen, and azote, it combines in preference the bases of the two former gases, that is hydrogen and oxygen. The electric spark ought therefore to occasion thunder solely in hot countries, and to produce aurora borealis alone in cold ones. This is in part found to be the case; the torrid zone is the ordinary theatre for thunder-storms; at 40 or 50 degrees they rarely occur out of the summer season, and near the poles they scarcely occur at all. The rain of a thunder-storm is accompanied by lightning, and generally preceded by a period of heat which greatly facilitates the decomposition of water; there must therefore be a great quantity of disengaged hydrogen, which is raised into the superior parts of the atmosphere, and this hydrogen, when passing into the gaseous state, carries with it a great quantity of electricity. Now it cannot be doubted, that lightning is produced by the electric fluid

But as to the rain that is formed the moment the lightning traverses the air, it can only arise from one of the two following causes: Either from sudden precipitation of the water which was dispersed in the atmosphere; or from the combination of the oxygen and hydrogen gas, occasioned by the electric spark. Libes remarks that the rain of a storm takes place very frequently without there having been any cloud to disturb the transparency of the atmosphere; yet it cannot be supposed that the water, which is in very small quantities, and perfectly dissolved in the air, can be so precipitated at once, as to form an abundant rain. Hence he recurs, on the contrary, to the electric spark, which in its passage, effected with inconceivable rapidity, meets with mixtures of oxygen and hydrogen gas, the combination of whose bases becomes effected, and gives birth to those violent explosions, called thunder, as well as to a quantity of rain, proportional to the quantity of aeriform fluids; or, in other words, proportional to the oxygen and hydrogen gas, whose bases have been combined by the electric fluid passing through them. This hypothesis explains clearly how there may be lightning without thunder, though there may be many clouds in the air at that time; and why there should be many thunder-storms in hot countries, and few in cold ones. For if there be not the proper proportion of oxygen and hydrogen gas in that part of the atmosphere through which the electricity darts, no explosions can take place.

This theory is most ingenious; but it is not without its difficulties. Could it be satisfactorily proved that thunder was really the noise occasioned by the explosion of the two gases, as the report of a cannon is caused by the ignition of the powder, it would stand a fair chance of being the prevailing theory; but many objections can be urged against it. It has however been almost universally adopted by the Northern philosophers on the continent.

Ballymena, Co. Antrim. J. GETTY.

P. S. Similar lights have frequently been observed towards the South Pole, called *Aurora Australes.* See Philosophical Transactions, No. 461, Sec. 23—25; and Vol. 54, No. 53.



LORD O'NEILL'S COTTAGE, RAM'S ISLAND, LOUGH NEAGH.

This beautiful little cottage is situated in one of the small islands of Lough Neagh, at a distance of three miles from Crumlin, and about one mile and two-thirds from the shore, from which the traveller can easily procure a boat for the purpose of visiting the island. The cottage, which is extremely pretty, and furnished in the most tasteful manner, was some time since erected by Earl O'Neill, to whom it belongs.—The only object of antiquity here is a round tower, of which

> ———"Time, with assailing arm,
> Hath smote the summit, but the solid base
> Derides the lapse of ages."

We are informed by the Rev. Doctor Cupples, that its height is forty-three feet, its circumference thirty feet five inches, the thickness of the walls two feet eight inches and a quarter; the first story contains the door—the second, a window facing the south-east—and the third, another window, which looks out to the north, about three feet high, and one and a half broad. There are two rests for joists, and, in the first story, there is a projecting stone, about five feet and a half from the surface. Certain letters or characters appear to be cut on the stones, in the inside; but so obliterated are they by time, that they are quite illegible. A hollow sound or echo is heard on entering the building; this induced a person who lived in the island, to dig five feet below the surface, where he found several human bones, and some coffin boards. A skeleton was discovered near the tower some time ago, and bones and skulls in many parts of the island. These circumstances indicate, that a place of worship once existed here; and sanction the opinion of Dr. Ledwich, that the round towers were appropriated to ecclesiastical purposes. It might also be inferred from this that the island was, at no very remote period, a part of the continent. When the lake is at its summer level, a bank appears, extending from the island towards Gartree Point. Some persons who have examined it at low water assert, that the remains of a paved causeway are visible. The entire ground is laid out into walks, and covered with verdure. Several hundred rose trees, and